



Fukunaga, a Coffee Rootstock Resistant to the Kona Coffee Root-Knot Nematode

H. C. Bittenbender¹, D. P. Schmitt², Mario Serracin², and C. G. Cavaletto¹

Departments of ¹Tropical Plant and Soil Sciences and ²Plant and Environmental Protection Sciences

A selection of Liberica coffee has been developed by the College of Tropical Agriculture and Human Resources (CTAHR), University of Hawaii at Manoa, for use as a rootstock in areas where the Kona coffee root-knot nematode (*Meloidogyne konaensis*) is found. When this rootstock is grafted with *Coffea arabica* cultivars 'Guatemala' (also known as "Kona typica") and 'Progeny 502', the resulting plants have good yield, moderate nematode resistance, and excellent cup quality. A Kona coffee brewed from beans of 'Progeny 502' grafted onto this new coffee rootstock won the 2000 Kona Coffee Cultural Festival cupping competition.

The new rootstock selection is being named after Mr. Edward T. Fukunaga, who was the superintendent of CTAHR's Kona Research Station in Kainaliu from the 1950s through the 1970s, when it was known as the Hawaii Agricultural Experiment Station's Kona Branch Station. Eddie Fukunaga was a leader in the Kona coffee industry as well as in community life in Kona. During his career in the CTAHR Cooperative Extension Service, he authored several dozen publications focused on the practical aspects of producing coffee, macadamia, and other crops. He developed the "Beaumont-Fukunaga" coffee pruning technique that is still used in Hawaii and throughout Latin America.

During the mid-1950s, Mr. Fukunaga worked on solving a "re-plant" problem occurring in Kona's coffee farms, where young plants would die when planted to replace bearing trees that had died. He and other UH scientists assembled a large collection of coffee species and varieties. One of those accessions, obtained from the coffee research program of the Instituto

Agronomico do Campinas in Brazil, is the selection now being named for him.

Mr. Fukunaga and CTAHR horticulturist Philip J. Ito initiated experiments with rootstocks in the early 1970s. One purpose of these was to demonstrate a grafting technique known as the "Reyna method" a type of cleft graft using just-germinated coffee seedlings (see photo, p. 2). Another purpose was to evaluate the cup quality of coffee from the grafted trees.

After screening nine rootstock accessions from seven coffee species, Ito began a second experiment with the most promising rootstocks in the 1980s, after Mr. Fukunaga had retired. By 1994 it was clear that the rootstock selection now being named Fukunaga produced the highest yield among the accessions tested when grafted with 'Guatemala,' and the resulting crop also retained the cup quality of coffee from ungrafted, seedling 'Guatemala' plants. More recently, the work begun by these researchers has been continued by others in CTAHR, who discovered that the promising rootstock selection also conferred resistance to the Kona coffee root-knot nematode, which has become an increasingly serious threat to the Kona coffee industry.



Edward Fukunaga, 1910–1984

Characteristics of the Fukunaga coffee rootstock

The classification of coffee species and cultivars can be confusing. "Fukunaga" is being proposed as the common name for a selection of a plant named by botanists as *Coffea liberica* W. Bull ex Hiern var. *dewevrei* (De Wild. and T. Durand) Lebrun. Because botanists sometimes disagree with one another, this selection has also been classified as *Coffea dewevrei* (De Wild.). Fukunaga coffee

rootstock plants will not hybridize with commercial *C. arabica* cultivars. Because the rootstock species is not likely to be self-pollinating, two trees must be grown in close proximity to ensure pollination adequate to produce viable seed.

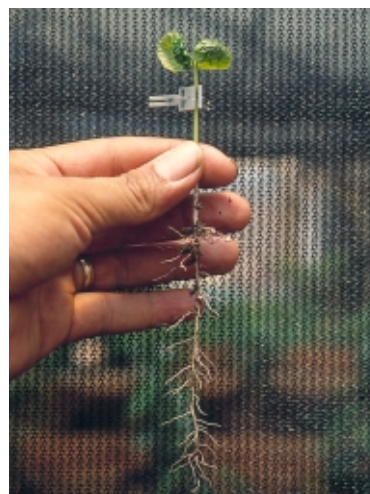
The Fukunaga coffee rootstock is being distributed as seed from the two original trees evaluated at the Kona Research Station.

Fruits (“cherries”) of the Fukunaga coffee rootstock plant measure 0.5–0.75 by 0.3–0.6 inches (13–19 x 8–15 mm). Its leaves are borne opposite one another on the sides of its branches; the leaves are large—up to 16 inches (40 cm) long—and heavily corrugated with veins

(see photo). Mature trees exceed 20 feet (6 m) in height, and if not pruned they may grow as tall as 30–35 feet (about 9–10 meters). The roots are moderately resistant to the Kona coffee root-knot nematode; a low level of nematode reproduction occurs on infected roots, but damage is slight and usually only detectable on 1–2-year-old trees. The Fukunaga coffee rootstock tree is vigorous, bearing several times a year, and its fruits and seeds mature rapidly. To avoid loss of viability, the cherries must be harvested before reaching the “raisin” stage, manually scarified, and planted immediately. Because coffee brewed from the beans of Fukunaga has poor cup quality, the selection is suitable only as a rootstock.



Large, corrugated leaves of the Fukunaga rootstock, compared with the smaller leaf of *Coffea arabica* ‘Guatemala’.



The Reyna grafting method involves careful grafting of recently germinated plants. The scion is attached to the rootstock with a tiny clip. This plant was grafted about two weeks before the picture was taken.